UEF 11/30/07

Welcome and Introductions

1. Topic for today: renewable energy. Important part of energy portfolio along with conventional resources. Economic benefit of energy produce, and benefits for communities where utilized, and the technologies that are being developed. Sustaining our quality of life here.
2. Sponsors: Utah Clean Energy, enXco, Wasatch Wind, Interwest Energy Alliance.

Sarah Wright: Director of Utah Clean Energy: A Comprehensive Energy Efficiency Strategy for Utah:

1. Meet the State's part of their energy demand through EE.
2. EE vs Conservation: conservation is turning off lights, lowering thermostat, behavioral stats. EE is once it is put in place, it is an energy resource going forward, use like any other resource. Meeting our growing load.
3. 2006 Legislature: looked at Energy policy in Utah: HB 46 Energy Policy Amendments: Policy of the state that Utah will pursue energy conservation, energy efficiency and environmental quality. Governor goal is 20% by 2015
4. Strategy Overview: evaluated 23 policies and initiatives; electricity, natural gas, gasoline, and diesel fuel; savings potential, cost, cost effectiveness; environmental and social benefits, and other considerations; defines 20% efficiency improvement at 16.7% reduction in energy use.
5. Save energy, save money, prevent pollution. Save $7.1 Billion dollars a year. Energy savings: 128 trillion BTU
6. Most of the savings are in the transportation sector. Clean car standards. CA started it, and waiting for EPA OK. Huge net economic benefit, manufacturers have to build more efficient cars and better cleaner cars. Innovative insurance policies.
7. Some Utility programs, already have some good programs in Pacificorp and Questar. Questar started DSM this year.
8. More energy use: bigger homes, more appliances, air conditioners instead of swamp coolers, (plasma tv uses as much energy as efficient refrigerator).
9. Gasoline and diesel will start to level off. In the legislative gave this talked and discussed about energy security. If we paid at the pump what we pay in taxes just to keep the passages open, we would be paying $7 at the pump.
10. High priority policies:
    a. DSM programs
    b. Expand natural gas utility energy efficiency programs
    c. Building codes, and enforcement of those codes. 50% of the homes that will be here by 2030 have not yet been built (U.S.) Huge opportunity. State working on code training and enforcement. Working with legislature for incentives for builders that go above and beyond to drive the market.
    d. Lamp and appliance efficiency standards. NV passed last year. No sponsor for this year, but still looking at.

e. Expand low income weatherization. Low income are hurt disproportionately by rising energy cost.
f. Industry challenge and recognition program
g. Target state agencies, already leading by example
h. Clean car standards
i. Pay as you drive insurance.
j. Reduce rate of vehicle use. Transit oriented development very important in this state. Especially along the Wasatch front and air quality.
k. Broad based public education campaign.

11. Next steps:
    a. Develop specific policies
        i. EE building and vehicle incentives
        ii. Bldg codes
    b. Provide education to policy makers the general public and professionals about energy efficiency
    c. Monitor success

Paul Thomas: Public Policy Manager, Ormat Technologies, Inc.: Geothermal Development in Utah: The Reality of Today, and the Promise of Tomorrow."

1. Geothermal: Been around for 100 years and is pretty conventional already. Made very efficient.
2. Vertically integrated company. Design the equipment and operate the plant as well. 40 years. 350 mw in US and 1000 MW in the worldwide
3. 2006 $289 million in sales.
4. Flash technology: geysers and drill hole: the pressure out of the ground produces steam, put there and creates energy. Looking at resources without that temperature at the surface. Binary process; bring hot water to heat exchanger: vaporizes at lower temp and doesn't have to be heated as much and creates pressure and steam. Closed loop, no emissions. Pump back into 100 degrees lower than use it. No environmental as the problem when out in air. We have taken the same technology. Using heat from existing exhaust systems. Capture and produce additional electricity with no new emissions. Waste Heat.
5. Utah has 1 geothermal plant owned by Pacificorp. Ormat put bottoming cycle on it. 27 MW in operation. With good incentives we could have a much bigger number. Ormat only NV 100 MW in operation, 70-100 in development and construction. Result of RPS in NV. 170-200 MW by 2010. 15 geothermal prospects. RPS gives security to companies to build these plants.
6. WGA Clean and Diversified Energy Initiative: Real developers with real projects and ask real potential. Report says that almost 13K MW of geothermal can be developed in Western US. 230 in Utah alone in the near future. If you double the price, 620 MW is prospective. Base load resource 24/7/365.
7. Map of identified geothermal resources.
8. 1MW of geothermal power
    a. 720 homes or 3K people (230 172500 homes)
    b. 3.500.000 total investment
    c. Offset 7500 tons of co2

    d. Offsets 2,200 tons of oil. Equivalent fuel used by 1000 cars
    e. Offsets 3.5 millions gallons of water that conventional steam plants use for make up water.
9. Economic impact: rural development, tax base for those communities. 1 MW is 3.5 million capital expense.
10. Jobs 230 would create 978 full time jobs, and 3680 person*years of work. 30 year economic output of $3.4 billion.
11. Federal policy drivers
    a. Federal production tax credit.
    b. DOE geothermal research
    c. Investment tax credit for CHP(ITC).
12. State policy drivers
    a. Utility policies
    b. Tax credits
    c. University research
13. Local
    a. Incorporating geothermal development (Reno)
    b. Outreach
    c. Education
14. Building local partnerships
    a. Nevada geothermal council
15. State RPS
    a. Huge shift for us cost effective mechanism for RE
    b. Federal discussion looking at this as well.
    c. We operate in 3 states, and all those states all have RPS. From a developers point of view this is crucial.

Larry Flowers: Wind Powering America Program Technical Director: NREL: Wind: A Utah Opportunity

1. Not wind vs coal it is a wind AND coal. They are not here to kick coal, but to be honest and objective about wind. Both wind and coal robust resources
2. Many sizes, up to 3-5K mw size.
3. over 13K installed US, internationally 80K. US emerged as number 1 country market in the world. 4K will be installed this year. Need to get into 16K per year implementation. Money is coming to US and starting to build manufacturing plants this year. Very good, instead of buying from Europe.
4. 16 states that are serious about wind over 100 mw, and 6 states over a 1000 mw end of next year. Huge growth over 5 years.
5. Declining wind cost, fuel price uncertainty, federal and state policies(production tax credit), economic development, public support, green power, energy security, and carbon risk: All drivers for Wind Power.
6. Wind costs vs other energy. Price is going down. (2 years ago. Projects going in right now from 2005 when prices were high for everything) New wind is pretty competitive with new coal and cheaper than new gas. Depreciate coal is cheaper, but when wind depreciates will be cheaper.
7. Chart on CO2 prices significantly increasing cost of coal.

8. 25 states with RPS standards now. Very significant numbers and drivers. Investment in the home market
9. Economic development
10. Local Ownership Models: Minnesota farm cooperative. FLIP Structure. Farmer owned small wind. Farmer owned commercial scale.
11. Environmental benefits
    a. no SOx or NOx
    b. no particulates
    c. no mercury
    d. no CO2
    e. no water
12. Key issues for wind power
    a. Policy uncertainty
    b. Siting and permitting
    c. Transmission
    d. Operational impacts
    e. Accounting for non monetary value
13. State of the Union address,
    a. invest in wind can supply %20.
        i. Development benefits
        ii. 45 states involved
        iii. Employment 180k Jobs
        iv. Water savings
        v. Carbon savings
14. cost and benefit:
    a. incremental direct cost to society
    b. reduction in GHG
    c. Reduction in water consumption
    d. job created, economic benefits
    e. natural gas reduction us
    f. net benefit 205 billion, + water savings

Thomas Mancini: Program Manager Concentrating Solar Power: Sandia National Laboratories: Concentrating solar power for Utah: resource potential and benefits

1. Technology background: most people think of Photovoltaic and distributed generation. Today going to focus on large scale systems and utility power
2. Trough, Tower, and Dish systems. Solar concentration allows tailored design approaches for central and distributed power generation.
3. Concentrating solar power
    a. Utility –scale power
    b. Thermal energy is collected and use to drive an engine or generator
    c. High capacity factor dispatchable power with thermal storage or hybridization
    d. 130 plant years of commercial operation demonstrated
    e. 80MW/year production/installation capacity
    f. Trough are most mature technology

    g. Current bid costs are in the range of 12-16 cents per kWhr. Costs go down with deployment, comes under 10 cents.
4. Tax credits
    a. (3 years for building a plant)
    b. Production, Then we don't pay for the effects of the future regarding the environment
    c. The tax investment credit up and down in the federal is killing. Not stable. It is very important incentive.
    d. Project 3-5 years, and tax incentive for 2 years only right now. Not useful
5. APS organic 1 MW
6. CLFR technology: parabolic trough tech, but not yet demonstrated on scale.
7. Molten Salt Power Tower: Energy collection is uncoupled from power production. Can have large capacity factors. 7 ½ hours of thermal storage.
    a. The Value of storage dispatchable power:
        i. Storage/hybridization provide decoupling of energy collection and generation: lower costs because storage is cheaper than incremental turbine costs: higher value because power production can match utility needs.
        ii. Not base load
8. Most efficient of three technologies: Dish. Always tracks right on the sun and no loss. Sterling engine 45% mechanical efficiencies. Doesn't use the water that the other systems do. Can't store the energy as readily.
9. DNI: directly to you: You can do a lot with different levels.
    a. Filters applied: direct-normal solar, sites >6.75kwh, exclude environmentally sensitive lands, major urban areas, remove land slope >1%, only contiguous areas.
    b. UT potential 450,000 mw of CSP capacity.
    c. With new transmission could export clean energy
10. Benefits to UT (based on studies for CA, NV, NM)
    a. Construction 1016 jobs
    b. Operation 38 jobs
    c. Average wage $45,800
    d. Private investment $370 million
    e. 30 year tax gain: $200+ million
11. If Utah were to build 1000 MW
    a. 2-4 billion investment in State of Utah
    b. 3K to 4K jobs construction
    c. 250 permanent solar jobs
    d. 1.0 billion in state tax revenues
    e. $447 million and income and 14K jobs
12. It is the states that are providing the incentives for these programs.

Q&A

Putting efficiency piece with other renewable piece? 20% is realized in electricity sector. Could we add more renewable and still pay the same with the energy efficiency coming in.

Anyone would save money by putting energy efficiency standards in, have not put together with renewable

80% of Utah land is public land, that we have no hope for renwables

Nv is 90% owned. The policy act streamlined, big help, adding more and very active.

Private or Public better

Looking at alternative policy to make more friendly with BLM. BLM policies were disincentives, changed some policies to make more ameanable. Forest service not quite there, but BLM made significant changes. Open dialogue with BLM and federal land issue is not a big issues

Given that most renewable energy is where there is no infrastructure to support distribution? What is being done?

Number one issue for wind about 20% vision is transmission. South Dakota has great potential, but not structure. Number one issue is siting issues, timing issue, and policy issues. Sometimes have to cross state boundaries. No good interstate regulatory body. Have to look at good transmission. Second issue is using transmission we have more efficiently. Lots of time where plenty of room, but not contractor room. Need to change some tariffs, FERC is looking to do this. Constraints is Summer Peak, usually when wind is lower anyways. Other thing is penalty from back in Enron days: 24 hours notice, penalty .10. Cost based.

Transmission is an issue for everyone, not just renewable. Aging transmission infrastructure in this country. Talked about a lot but nothing really done. DOE renewable energy transmission corridors. Renewable Energy Transmission Authority: new authority that will go in place to move renewable energy. A lot of things going on. Tends to be more important for renewables because of where they are located.

Other big issue of transmission: who pays. Long term cost. Big problem in trying to recover the cost of the transmission. Have to start planning today, planning, permitting, and figure out way to allow utility to get cost recovery of those transmissions now so that when we get those resources they can come online.

First step this year a bill passed for renewable energy development zones in Utah and will be using some state GIS capabilities to bring those into Utah when ready

Provide some kind of ancillary benefits, don't see a problem with financing those. Integration issues.

WGA recognize and started to work on a few years ago. Coincides with Western grid. Working together on a number of transmission projects to make sure that as state we are doing what we can to answer questions, and address any concerns about routes, and are in position to move forward with transmission capacity that we will need for especially renewable and transportation and heating fuels, and existing resources. A number of states have taken renewable energy development zones a look at and prioritize to bring new resources online. Western Energy Interstate Board.

$750K per mile to ? per mile to install transmission line. It is a significant cost. Don't realize any income on that investment until you start to produce power.

Utah Clean Energy can you devote staff to collect interest to support the renewable energy development legislation?

Yes thank you

What is the carbon footprint per mw for those three options? Geothermal, solar, wind.

3.5 million total for geothermal. Small total environmental footprint. Low profile. Zero emissions. Geothermal people build within 100 yards? Because very low profile, very quiet, and not emitting.

100 mw winds, prices 1.6 million per MW. It does depend on the area. The rule of thumb is 50 to 70 acres per MW: total project. But only takes out of production ½ acre to acre per MW. Big land area total, but can use for other uses like agriculture, grazing, etc. Still other things in vicinity of the wind.

Solar is 3-5 acre per MW. 3-$3 ½ million per MW. But we are on the decline on those #'s.

All those resources are fuel free. All upfront are capital costs. So no fuel volatility or fuel costs.

Power produced royalty all the same?

Based on power produced, so it is different.

Solar: water consumption can you use Binary systems or recycling reduce that problem for water?

Problem in west is not any different for any other system. Most of the water usage is for cooling. Small is used for washing mirrors etc.

7.1 billion dollar savings over what period of time?

Net economic starting 2007, until life of it. 20 year life is the latest we figured. It is over the life of the measures that are installed. Some things will end earlier.

The target the governor set was 2015, the continuation of the benefit of those measures by2020 is 25% not doing anything additional.

Solar work in Germany, are there equivalent sites in SL County that are equivalent of Germany? For public education.

Photovoltaic would be very applicable here. Yes solar technologies that would apply.

Issue of intermittent vs base load power for wind? Wind farms for base load.

Common question and concern. Utilities historically planned on capacity, carbon constrained. Wind is an energy resource and not a capacity resource. When put into a particular system. The load carrying capacity goes up from 5% to 40% based on load. Paradigm shift that has to happen. Put it in and see what does to system and then see what capacity is.

Great for RD&D storage, looking at ways to store energy. Hope to work into supporting technologies. Not a given technology at this time. Trough has potential to.

As you add diversity, that also significantly changes your capacity factor for the system. You need to have coal and wind on the transmission line to finance it. If you

have a big enough project, you can do a transmission line just for wind. You have to overbuild. It really depends.

Any difference between common project 100 MW, on public vs private funding?

All different types of financing schemes out there. Bonds, loans, FLIP, both public and private money for it all depends.

Ormat we finance all our own projects. Except tax incentive. We are all private.

CSP is operating in RPS states, only non private finance is the incentive program in those states will allow. Part of the cost of the project. DOE does have a loan guarantee, but problem is to have a power purchase agreement before can get it, but those issues are being worked at. Most part Private finance.

Next Utah Energy Forum

USTAR Focus, no date set yet.